DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
WASHINGTON, D.C. 20380-0001

IN REPLY REFER TO
3900
RDD241200ng
19 JAN 1988

From: Commandant of the Marine Corps

Subj: REQUIRED OPERATIONAL CAPABILITY (ROC) NO. LOG 216.1.2 FOR A PORTABLE HELIPORT LIGHTING SET (PHLS)

Ref: (a) MCO 3900.4B

Encl: (1) Subject ROC

1. In accordance with the procedures set forth in the reference, the PHLS ROC is hereby promulgated.

2. Points of contact regarding inquires relative to this ROC are:

a. Commanding General, Marine Corps Reserch, Development and Acquisition Command, Quantico, Virginia.

b. Commanding General, Marine Corps Combat Development Center, Quantico, Virginia.

M. A. STANKOSKY
By direction

Distribution:
(see attached)

DISTRIBUTION LIST
REQUIREMENT DOCUMENTS

(CURRENT AS OF 870601)

Marine Corps		Copies
CG, FMFLANT, (Attn: G-3) Norfolk, VA 23515-5001		(3)
CG, FMFPAC, (Attn: G-3) Camp Smith, HI 96861-5001		(3)
CG, MCDEC, Quantico, VA 22134-5080 (Attn: DevCtr D083)		[2-(C) 10-(U)]
CG, I MAF, Camp Pendleton, CA 92055-5401		(3)
CG, III MAF, FPO San Francisco, CA 96606-8401	*	(3)
CG, 1st MarDiv (Attn: G-3), Camp Pendleton, CA 92055-5501		(1)
CG, 2d MarDiv (Attn: G-3 Plans), Camp Lejeune, NC 28542-5501		(1)
CG, 3d MarDiv, FPO San Francisco, CA 96602-8601	*	(1)
CG, 4th MarDiv, 4400 Dauphine St, New Orleans, LA 70146		(1)
CG, 1st MAW, FPO San Francisco, CA 96603-8701	*	(1)
CG, 2d MAW, MCAS, Cherry Point, NC 28533-6001		(1)
CG, 3d MAW (Attn: G-3), MCAS, El Toro, CA 92079-6001		(5)
CG, 4th MAW, 4400 Dauphine St, New Orleans, LA 70146		(1)
CG, 1st MAB,(G-3) FMF, MCAS, Kaneohe, HI, 96863-5501	*	(3)
CG, LFTCLANT, U.S. Naval Phib Base, Norfolk, VA 23521		(2)
CO, LFTCPAC, NAB, Coronado, San Diego, CA 92155-5034		(1)
CG, 1st FSSG, (Attn: CSS OPS) Camp Pendleton, CA 92055-5701		(1)
CG, 2d FSSG, FMFLANT, MCB Camp Lejeune, NC 28542-5701		(1)
CG, 3d FSSG, (Attn: G-3) FPO San Francisco, CA 96604-8801	*	(1)
CG, 4th MAB, FPO New York, NY 09502-8504	*	(1)
CG, MCAGCC, Twentynine Palms, CA 92278-5001		(1)
CG, MCLB, Albany, GA 31704-5001		(1)
CO, MAWTS-1, MCAS, Yuma, AZ 85369-6073		(1)
CO, MAD, NAS, Patuxent River, MD 20670		(1)
CO, MCCES, MCAGCC, Twentynine Palms, CA 92278-5020		(1)
CO, AIRTEVRON Five, China Lake, CA 93555		(1)
CO, MC Engineer School, MCB, Camp Lejeune, NC 28542-5040		(2)
MARCOR AIDE, ASN (RE&S), Rm 4E736, Pentagon, Wash, DC 20350		(1)
MCLNO, ADEA (Mode-MC), Ft Lewis, WA 98433-5000		(1)
MCLNO, USA Avn Bd, Ft Bragg, NC 28307		(1)
MCLNO, Directorate of Combat Dev, Ft Knox, KY 40121		(1)
MCLNO, RDA, DCD, USAFAS (ATSF-CD-A), Ft Sill, OK 73503		(1)
MCLNO, USAAVNC, ATZQ-CDM-MC, Ft Rucker, AL 36362-5000		(1)
MCLNO, USAEPG (STEEP-ML), Ft Huachuca, AZ 85613		(1)
MCLNO, USA CECOM, Ft Monmouth, NJ 07703		(1)
MCLNO, USA Missile Cmd, USAMICOM (AMSMI-USMC), Redstone Arsenal, AL 35898		(1)
MCLNO, USA Test&Eval Cmd, Aberdeen Proving Ground, MD 21005-5056		(1)
MCLNO, USA Armament Material Readiness Cmd (MCLNO-LMC), Rock Island, IL 61299		(1)
MCLNO, USA CbtDev Experimentation Cmd, Ft. Ord, CA 93941		(1)
MCLNO, DOX#4, USA Natick RD&E Center, Natick, MA 01760-5000		(1)
MCLNO, NTEC, (N-001), Orlando, FL 32813		(1)
MCLNO, NSWC/DL (C5), Dahlgren, VA 22448		(1)

MCLNO, U.S. Army Infantry School, (ATSH-CD-MLS), Fort Benning, GA 31905-5400 (1)
MCLNO, NWC (Code 03A3), China Lake, CA 93555 (1)
MCLNO, NCEL, Port Hueneme, CA 93043 (1)
MCLNO, (ATFE-MC) Headquarters US Army Training Doctrine Command, Fort Monroe, VA 23651-5022 (2)
MCLNO, USOTEA CSTE TM JT, 5600 Columbia Pike, Falls Church VA 22041 (1)
MCLNO, NOSC, (Code 033) San Diego, CA 92152 (1)
MCLNO, HQ, USA Mat Dev & Readiness Cmd, 5001 Eisenhower Ave, (DRCGS-F), Alexandria, VA 22333 (1)
MCLNO, Naval Air DevCtr (Code 09L2), Warminster, PA 18974 (1)
MCLNO, Directorate of Combat Developments, USAADASCH Ft Bliss, TX 79916 (1)
MCRep, (Code 0309) Naval Post Grad Scol, Monterey, CA 93943 (1)
MCRep, USA Armor School, Ft Knox, KY 40121 (1)
MCRep, Engineer School, Ft Belvoir, VA 22060 (1)
MCRep, Nuclear Wpns Trng Ctr Pac, NAS North Island, San Diego, CA 92135 (1)
Dir, MCOAG, 4401 Ford Ave., P.O. Box 16268, Alexandria, VA 22302-0268 (1)
Dir, MCOTEA, Quantico, VA 22134-5017 (2)
USMC-LNO, USA Tank-Automotive Cmd, Warren, MI 48397-5000 (1)

Army

DC/S for RD&A (DAMA-WSZ-B) DA, Wash, DC 20310 (1)
OASA (RDA), CARD-CM (Attn: MCLNO) DOA, Wash, DC 20310-0650 (1)
Asst Chief of Eng, HQDA, Rm 1E682, The Pentagon, Washington, DC 20310-2600 (2)
Cmdt, USA C&SC (Attn: Doc Ctr, Library Div), Ft Leavenworth, KS 66027 (1)
Cdr, USACAC, (Attn: ATZL-CAM-I), Ft Leavenworth, KS 66027 (2)
Cdr, USA MICOM, DRSMI-ROC, Redstone Arsenal, AL 35898 (1)
Cdr, USASSC, (Attn: ATSG-PDO), Bldg 401, Ft Benjamin, Harrison, IN 46216-5700 (1)
Cdr, USA Natick RD&E Ctr, Natick, MA 01760 (STRNC-EML) (1)
CAC LnO, USA CAC Liaison Office, Alaska (Attn: ATZL-CAL-AK), Ft Richardson, AK 99505-7800 (1)

Navy

CNR, Code 100M, 800 N. Quincy St., Arlington, VA 22217 (1)
CNO (OP-098R), RM 5C678, The Pentagon, Wash, DC 20350 (1)
Dir, Office of Program Appraisal, Room 4D730, The Pentagon Washington, DC 20350 (1)
Cdr, Space & Naval Warfare Systems Command (PD-70) Wash, DC 20363-5100 (1)
Cdr, Naval Sea Systems Command (PMS-377), MC Advisor Washington, DC 20310 (1)
Cdr, Nav Sup Sys Cmd, R&T (SUP 033), Wash, DC 20360 (1)
Cdr, Naval Surface Force, U.S. PacFlt, San Diego, CA 92155 (1)
Cdr, NavSurFor, (N66) U.S. LantFlt, Norfolk, VA 23511 (1)

CO, U.S. Navy Research Lab (Code 2627), Wash, DC 20375 (1)
Cdr, D. W. Taylor Nav Ship R&D Ctr (0111) Bethesda, MD 20084 (1)
Cdr, Naval Surface Wpns Ctr (Attn: Tech Library), Silver Spring, MD 20903-5000 (1)
Cdr, Naval Air Test Ctr (CT 252), Patuxent River, MD 20670 (1)
Cdr, NOSC, San Diego, CA 92152-5000 (1)
CO, Naval Underwater Sys Ctr (TechLib), Newport, RI 02841 (1)
CO, NAVEODTECHCEN, Indian Head, MD 20640 (1)
CO, Naval Coastal Sys Ctr, TISB, Panama City, FL 32407-5000 (1)
CO, USN Wpns Eval Fac (Code 60), Kirtland AFB, Albuquerque, NM 97117 (1)
CO, Navy Personnel R&D Ctr, San Diego, CA 92152 (1)
CO, Naval Medical R&D Cmd, NNMC, Bethesda, MD 20014 (1)
CO, Nav Sub Med Rsch Lab, Box 900 Naval Submarine Base New London, Groton, CT 06349-5900 (1)
MGR, NARDIC, 5001 Eisenhower Ave, (Rm 8S58) Alexandria, VA 22333 (1)
MGR, NARDIC, 1030 E. Green St., Pasadena, CA 91106 (1)
MGR, NARDIC, Air Force Wright Aeronautical Lab/TST, Area B, Bldg 22, Rm S122, Wright Patterson AFB, OH 45433 (1)

Air Force

C/S, USAF (AF/XOXQ), The Pentagon, Washington,DC 20330-5057 (2)
TAC/DRP, Langley AFB, VA 23365 (1)
Dir, Air Univ Library, Maxwell AFB, AL 36112 (AUL3T-66-598) (1)
MCLNO, HQ ESD/TCR-2 HANSCOM AFB, MA 01730 (1)

Department of Defense

USDRE, Room 3E1044, The Pentagon, Wash, DC 20350 [Attn: DUSD (TWP)] (3)
USDRE, Room 2C330, The Pentagon, Wash, DC 20350 [(Attn: AMRAD Cte (MC/Nav Mbr)] (1)
Administrator, DTIC, Cameron Station, Alexandria, VA 22314 (10)
DCA, JTC^{3}A, Attn: C^{3}A-ARM-C, Washington, DC 20305-2000 (1)
Dir, NSA [R2 (2), P2 (1)] Ft George G. Meade, MD 20775 (3)

CMC Codes:
A
CC
INT
L
M
P
RES
RP
T

PROPOSED
REQUIRED OPERATIONAL CAPABILITY
(ROC) NO. AVN 261.1.2
FOR A
PORTABLE HELIPORT LIGHTING SET (PHLS)

1. STATEMENT OF THE REQUIREMENT. Marine Corps units involved in night vertical assault operations need an updated system for marking and identifying landing zones (LZ's). Desired initial operational capability (IOC) is 1990.

2. THREAT OR BASIS OF NEED. The current LZ designation system, the helicopter portable lighting set, NAEC 515420-1, used by Marines, is excessively bulky (the container is 38"x28"13" and weighs 168 pounds (lbs)), and is based on a color-coded "meat ball" type glide angle indicator light (GAIL) and eight position lights which use incandescent light bulbs. The brightness of the GAIL incandescent lights is not compatible with the pilot's use of night vision goggles (NVG). The GAIL is approximately 13"x15"x11", is supported by a small tripod, is easily blown over or misaligned by rotor wash, weighs 31 lbs, and requires two BA-200U radio batteries. Each position light is 8"x6"x8" and weighs 12 pounds. The GAIL and the position lights are not waterproof, which precludes a submarine insertion without separate waterproofing. The GAIL lighting system must be continuously manned in order to manually activate each light and realign the GAIL, if required. A remote control capability would enable the ground unit to depart the area once the marker/identifier lights are staked in position with the radio receiver in the standby mode.

3. OPERATIONAL AND ORGANIZATIONAL CONCEPTS

a. Operational Concepts. In order to provide the unit commander with the greatest possible flexibility, the PHLS should consist of two components (an approach path indicator (API) and LZ marker lights) packaged as a set. The API will provide a tri-colored glidepath to assist the pilot to a safe landing in a designated permissive LZ. The remotely controlled LZ markers will be used to mark the perimeter of the LZ and will have both an infrared (IR) and incandescent light capability. This would enable the markers to be used in conjunction with the API or separately to designate a non-permissive LZ. In the incandescent mode, the API and the LZ marker lights would be used to train pilots in night vertical assault operations and also would be used for missions flown into permissive LZ's. Pilots flying in a night vertical assault may use NVG's and employ terrain-following flight techniques. As elements of the flight cross the initial point (IP), the flight leader activates an IR LZ marker/identifier (a strobing marker light) using the aircraft's UHF radio transmitter. Once the LZ has been visually identified the pilot will turn the marker off. It can then be turned back on by each successive wave, if required. As the aircraft begin to transition to landing, the LZ marker lights will be activated to

enable the pilots to define the perimeter of the LZ. After the aircraft depart the LZ, the markers will be turned off by the pilot to await use by the next assault wave. The LZ markers will be highly visible to a pilot with or without night vision aids. The marker lights could also be used to mark the forward positions of friendly lines during close air support missions, or to designate appropriate beachheads during night amphibious assaults. The helicopter support teams (HST's) of landing support battalions will also use this system during HST and initial terminal guidance missions.

b. Organizational Concept. The PHLS will be a one for one replacement item for the current helicopter lighting set, TAM control number A0815.

4. ESSENTIAL CHARACTERISTICS

a. The PHLS should consist of one API and eight LZ marker lights.

b. The API and LZ marker lights will have the following capabilities:

(1) The system will have a five-mile range for remote control activation/deactivation by the aircraft's UHF radio. The remote control feature shall be of a design which prevents unintentional activation/deactivation of the light set by incidental UHF transmissions.

(2) The system will have a self-contained power supply that will provide power for 48 hours operation in the standby mode and then up to eight hours of continuous operation.

(3) The system will have integral tie-down structures to prevent misalignment due to wind, rotor wash, or jet exhaust.

(4) The system will be modular in construction to permit quick replacement of illuminating elements, radio receiving components, and power supply.

(5) The components of the light set will be packaged separately in waterproof/dustproof sealed containers. They will be capable of being employed in all geographic locations and weather conditions compatible with vertical assault operations.

(6) The system should be jam/intrusion resistant.

(7) All components of the PHLS should be as light in weight as possible and man-portable. The complete set will not exceed 100 pounds in weight 36"x24"x12" in size to include power supply and packaging.

(8) Simplicity of field maintenance will be a major feature. All field maintenance will be performed without special tools or equipment.

(9) The receiving antenna must be easily stowed, deployed, detached, and replaced without the use of tools.

(10) The system will have a multi-position, detent stop brightness control capable of both manual and remote activation.

(11) The system will have a self-test switch enabling personnel to check the system without activating the lights.

(12) It is desired that the light set have a multiple-mode receiver which would make the set compatible with all DoD and NATO VSTOL aircraft.

(13) Reliability, Availability and Maintainability (RAM)

(a) Reliability is defined as the probability that an item will perform its intended function for a specified time interval under stated conditions. An operational mission failure is defined as that condition in which the system can not perform all the stated capabilities. The specified interval for the PHLS is a mission duration (MD) equal to eight hours of continuous operation. The PHLS will have a minimum acceptable mean time between operational mission failure (MTBOMF) of 250 hours and a desired MTBOMF of 750 hours. A 90 percent confidence level is required for the MTBOMF. Specifications of the system MD and MTBOMF enables the calculation of the required system reliability in accordance with the exponential probability density function. The PHLS design will provide a reliability of no less than 0.969 with 0.989 desired.

(b) Maintainability. The mean time to repair (MMTR) an operational mission failure, at the 90 percent confidence level, shall be no more than 0.5 hours for unscheduled maintenance at the organizational level. The mean time between preventive maintenance (MTBPM) for the PHLS will be eight hours organizational level and no preventive maintenance will be performed at higher levels of maintenance. The mean time to perform preventive maintenance (MMTPM) will be 0.25 hours.

(c) Availability. Based on the preceding parameter specifications the PHLS will have a minimum inherent availability (Ai) of 0.998 and an achieved availability (Aa) of 0.968. The administrative and logistics delay time (ALDT) is assumed to be such that a minimum operational availability (Ao) of 0.911 is obtained. If the stated RAM parameters are met the ALDT must be less than 0.50 hours to meet this Ao assumption.

c. The marker lights will have the following additional capabilities:

(1) The marker lights will have an infrared and incandescent light capability. This will enable the one light set to support both permissive and non-permissive missions.

(2) The marker lights will have interchangeable lens covers in red, green, yellow, white, IR, and blue.

(3) The system must provide remote activation/deactivation and rapid visual acquisition at ranges up to five miles--night visual meteorological conditions and terrain permitting. The marker lights must remain visible during the final approach, transition to hover, and touchdown phases of landing.

(4) Four preset frequencies per light set are desirable with a minimum of two required. These frequencies should be capable of being changed by unit personnel as required.

(5) A remote control steady/strobing switching capability to aid in the rapid identification of the LZ.

(6) Be capable of manual activation by ground personnel.

(7) Be dull green/olive drab or woodland camouflage pattern in color.

d. The API will have the following additional capabilities:

(1) The API will provide a tri-colored light beam that will enable the pilot to distinguish whether the aircraft is high, low, or on the approach path. The color pattern will be compatible with DoD and NATO standards.

(2) The API should have a displacement switch that will disable it if it is moved more than two degrees in vertical azimuth.

(3) It is desired that the API incorporate fly up/fly down symbology to assist a pilot flying on NVG's in maintaining the glideslope.

(4) It is desired that the API provide the pilot a quick, accurate method to determine glide angle.

5. INTER/INTRAOPERABILITY. The PHLS has the same basic capabilities as the GAIL system plus the advantage of remote control and IR capabilities. It will be totally compatible with the existing lighting system. Since the marker lights will have an IR capability they will be compatible with NVG's used by pilots during night assault missions.

6. RELATED EFFORTS. Naval Air Systems Command is purchasing a prototype expeditionary airfield helipad lighting system. This system, consisting of 16 lights, has a UHF remote control and

IR/incandescent capability. The Air Force has a prototype developmental program to develop and test an eletro-luminescent light system for their forward field expeditionary runway lighting requirement.

7. TECHNICAL FEASIBILITY. This is considered to be a low risk program since the technology to update the present light set has been demonstrated by several private contractors.

8. LIFE CYCLE COST FORECAST. See annex (1).

9. MANPOWER REQUIREMENTS. There will be no impact on the force structure of current manpower authorizations as the PHLS is a one for one replacement for a currently fielded item.

10. TRAINING REQUIREMENTS. Since this PHLS is an update version of the existing GAIL system, there will be little impact on existing training or training support.

11. AMPHIBIOUS/STRATEGIC LIFT IMPACT. The PHLS will have a positive impact on amphibious/strategic lift requirements. The set will be lighter in weight and smaller in size than the existing GAIL system.

Major System: PORTABLE HELIPORT LIGHTING SET Date: 10-08-1987

LIFE CYCLE COST FORECAST

FUNDING PROFILE
In Thousands of FY89 Constant Budget Dollars
(FYDP Dollars in Parentheses)
(February 87 Escalators)

15 YEAR LIFE CYCLE

	PRIOR YEARS	CURRENT (FY88)	BUDGET (FY89)	FY90	FY91	FY92	FY93	FY94	TO COMPL'N	TOTAL PROGRAM
Major System										
RDT&E	0	0	100	14	0	0	0	0	-0	114
FYDP Dollars	(	0)(	100)(	14)(	0)(	0)(	0)(	0)		
PMC	0	0	0	10,740	0	0	0	0	0	10,740
FYDP Dollars	(	0)(	0)(	11,025)(	0)(	0)(	0)(	0)		
QTYS FUNDED	0	0	0	296	0	0	0	0	0	296
Support										
Support PMC	0	0	0	107	107	107	107	107	1,069	1,604
FYDP Dollars	(	0)(	0)(	110)(	113)(	115)(	118)(	121)		
MILCON	0	0	0	0	0	0	0	0	0	0
FYDP Dollars	(	0)(	0)(	0)(	0)(	0)(	0)(	0)		
O&MMC	0	0	0	504	504	504	504	504	5,035	7,555
FYDP Dollars	(	0)(	0)(	516)(	528)(	539)(	549)(	560)		
O&MMCR	0	0	0	18	18	18	18	18	186	276
FYDP Dollars	(	0)(	0)(	19)(	19)(	19)(	20)(	20)		
MPMC	0	0	0	21	21	21	21	21	217	322
FYDP Dollars	(	0)(	0)(	21)(	21)(	21)(	21)(	21)		
RPMC	0	0	0	1	1	1	1	1	9	14
FYDP Dollars	(	0)(	0)(	1)(	1)(	1)(	1)(	1)		
NAVY PROC	0	0	0	0	0	0	0	0	0	0
TOTAL PROGRAM	0	0	100	11,405	651	651	651	651	6,517	20,626
FYDP Dollars	(	0)(	100)(	11,706)(	681)(	695)(	709)(	723)		

THIS ESTIMATE WAS PREPARED BY THE ANALYSIS SUPPORT BRANCH, PLANS DIVISION, MCDEC, QUANTICO, VA. 22134 AUTO 278-3235.

Major System: PORTABLE HELIPORT LIGHTING SET Date: 10-08-1987

LIFE CYCLE COST ESTIMATE
(In Thousands of FY89 Constant Budget Dollars)
(February 87 Escalators)

15 YEAR LIFE CYCLE

PHASE/CATEGORY		SUBCATEGORY	CATEGORY	PHASE
I.	RDT&E PHASE			114
II.	INVESTMENT PHASE			10,920
	1. SYSTEM PRODUCTION/PROCUREMENT		10,740	
	A. Major End Item (Contractor)	9,764		
	B. Initial Provisioning/Spares, Repair Parts	976		
	C. Government Furnished/Added Equipment	0		
	D. Other Direct System Costs	0		
	2. SUPPORT EQUIPMENT PROCUREMENT		179	
	A. Ammunition	0		
	B. Weapons and Tracked Combat Vehicles	0		
	C. Guided Missiles	0		
	D. Comm-Elec Equipment	0		
	E. Support Vehicles	0		
	F. Engineer and Other Equipment	179		
	3. MILITARY CONSTRUCTION		0	
III.	OPERATIONS AND SUPPORT PHASE			9,593
	1. OPERATIONS		2,644	
	A. Operator Personnel/Training	0		
	B. Material Consumption	2,644		
	C. Energy Consumption	0		
	2. MAINTENANCE		6,773	
	A. Organizational Maintenance	795		
	1) Personnel/Training 222			
	2) Maintenance Material 455			
	3) Repair Material 118			
	4) Other 0			
	B. Intermediate Maintenance	209		
	1) Personnel/Training 6			
	2) Maintenance Material 0			
	3) Repair Material 47			
	4) Other 156			
	C. Depot Repair	4,345		
	D. Depot Overhaul	0		
	E. Unprogrammed Losses	1,425		
	F. Software Maintenance	0		
	3. INDIRECT SUPT, BASE OPS & MAINT, OTHER O/H COSTS		39	
	A. Base Operations	11		
	B. Other Overhead Costs	28		
	4. SUPPORT EQUIPMENT O&S		134	
TOTAL LIFE CYCLE COSTS				20,626

O&S PHASE--Reserves			611
1. OPERATIONS			93
A. Operator Personnel/Training		0	
B. Material Consumption		93	
C. Energy Consumption		0	
2. MAINTENANCE			508
A. Organizational Maintenance		28	
1) Personnel/Training	8		
2) Maintenance Material	16		
3) Repair Material	4		
4) Other	0		
B. Intermediate Maintenance		7	
1) Personnel/Training	0		
2) Maintenance Material	0		
3) Repair Material	2		
4) Other	5		
C. Depot Repair		152	
D. Depot Overhaul		0	
E. Unprogrammed Losses		321	
F. Software Maintenance		0	
3. INDIRECT SUPT, BASE OPS & MAINT, OTHER O/H COSTS			2
A. Base Operations		1	
B. Other Overhead Costs		1	
4. SUPPORT EQUIPMENT O&S			9